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POWER QUALITY IMPROVEMENT USING UNIFIED POWER QUALITY CONTROLLER BASED ON ZERO VOLTAGE SWITCHING ZERO CURRENT SWITCHING

[1]Catherin Jemima.B, [2]Jaishree.G, [3]Moganavalli.G, [4]Suruthi.T, [5]A.Mythili,
[1,2,3,4]UG Scholar, Dept Of EEE, The Kavery Engineering College, Mecheri,
[5]Asst Prof, Dept Of EEE, The Kavery Engineering College, Mecheri.

Abstract:
As the demand of electricity is increasing day by day, it is necessary to supply a good quality of power to customers. In the future, distribution system operators could decide to supply their customers with different PQ levels and at different prices. Due to the presence of non- linear loads in the system many problems like fluctuations, flickers, voltage sag, voltage swell etc. comes in the system. The device that can fulfil these demands is the Unified power quality conditioners (UPQC). This paper gives a comprehensive study of different components of UPQC along with different control strategies used for UPQC control.

Keywords: Active power filter (APF), Power quality, Unified Power Quality Conditioner (UPQC), Voltage sag and swell compensation, Active power filters, ANN, Fuzzy logic controller.

1. INTRODUCTION

The limited stretch of time Power Quality (PQ) are most important facets of any power way of using voice system today. feeble amount of power quality has an effect on user and can cause loss of producing, damage of appliances and necessary things, increase the power loss and so forward, out, on (in time). In present scenario the use of necessary things based on power electronics has produce force of meeting blow on power quality by harmonics. Power Quality is a function of power factor so the use of non-linear and low power factor load such as adjustable speed drives, computer power supplies, furnaces, power converters and traction drives are finding its applications at domestic and industrial levels. These nonlinear loads draw non-linear current and degrade electric power quality. The prime objective of power utility companies is to provide their consumers an uninterrupted sinusoidal voltage of constant amplitude. The term Active Power Filter (APF) is mainly used for the improvement of power quality. One modern solution that deals with both load current and supply voltage flaws is the UPQC. The UPQC is one of the APF family members. The main function of UPQC is to reduce the effect of problem occurs in supply voltage such as, sags, swells, unbalance, flicker, harmonics, and for load current power quality problems such as, harmonics, unbalance, reactive current and neutral current. The UPQC is consist of series and shunt active filters connected in cascade via a common DC link capacitor.

2. UNIFIED POWER QUALITY CONDITIONER

The Unified Power Quality Conditioner is a custom power device that is consist of series and shunt APFs for compensation of voltage and current. It places in the distribution system to reduce the disturbances that impact on the performance load. UPQC is the only multi functioning device which can reduce several problems power quality problems. Fig. 1. Unified Power Quality Conditioner (UPQC) consists of two distinct part: Power circuit formed by series and shunt PWM converters,

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UPQC controller The series PWM converter of the UPQC behaves as a controlled voltage source, that is, it behaves as a

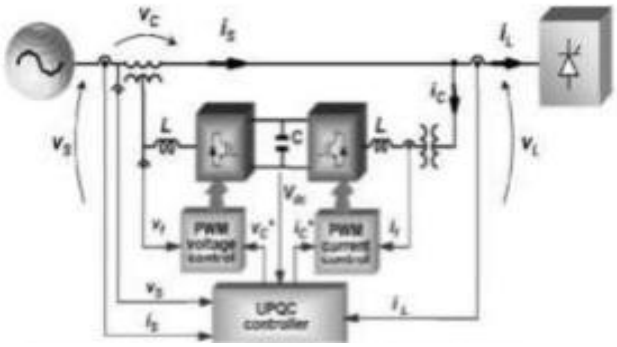

Fig.1.Configuraion of UPQC

series APF, whereas the shunt PWM converter behaves as a controlled current source, as a shunt APF. No power supply is connected at the DC link. It contains only a relatively small DC capacitor as a small energy storage element. The integrated controller of the series and shunt APF of the UPQC to provide the compensating voltage reference and compensating current reference IC* to be synthesized by PWM converters. The shunt active power filter of the UPQC can compensate all undesirable current components, including harmonics, imbalances due to negative and zero sequence components at the fundamental frequency.

3. POWER QUALITY

The widespread use of electronic equipment, such as information technology equipment, power electronics such as adjustable speed drives (ASD), programmable logic controllers (PLC), energy-efficient lighting, led to a complete change of electric loads nature. These type of load are responsible for power quality problem. Due to use of these low power factor and their non-linearity, These loads cause distortion and disturbances in the waveform of voltage and current. The increased sensitivity of the vast majority of processes (industrial, services and even residential) to PQ problems turns the availability of electric power with quality a crucial factor for competitiveness in every activity sector. The most critical areas continuous process industry and the information technology services. When a disturbance occurs, huge financial losses may happen, with the consequent loss of productivity and competitiveness. Although many efforts have been taken by utilities, some consumers require a level of PQ higher than the level provided by modern electric networks. This implies that some measures must be taken in order to achieve higher levels of Power Quality.

3. STRUCTURE OF UPQC

A fuzzy control system is a control system based on fuzzy logic which is much closer in spirit to human thinking and natural language than classical logical systems —a mathematical system that analyses analog input values in terms of logical variables that take on continuous values between 0 and 1, in contrast to classical or digital logic, which operates on discrete values of either 1 or 0 Fuzzy system transforms a human knowledge into mathematical formula. Therefore, fuzzy set theory based approach has emerged as a complement tool to mathematical approaches for solving power system problems. Fuzzy set theory and fuzzy logic establish the rules of a nonlinear mapping.When voltage interruption occurs from 0.2s to 0.6s then during that interval shunt inverter inject voltage to maintain

load voltage constant.In forward flow mode, shunt inverter with DG supplies power to the load in parallel with the main source. During normal

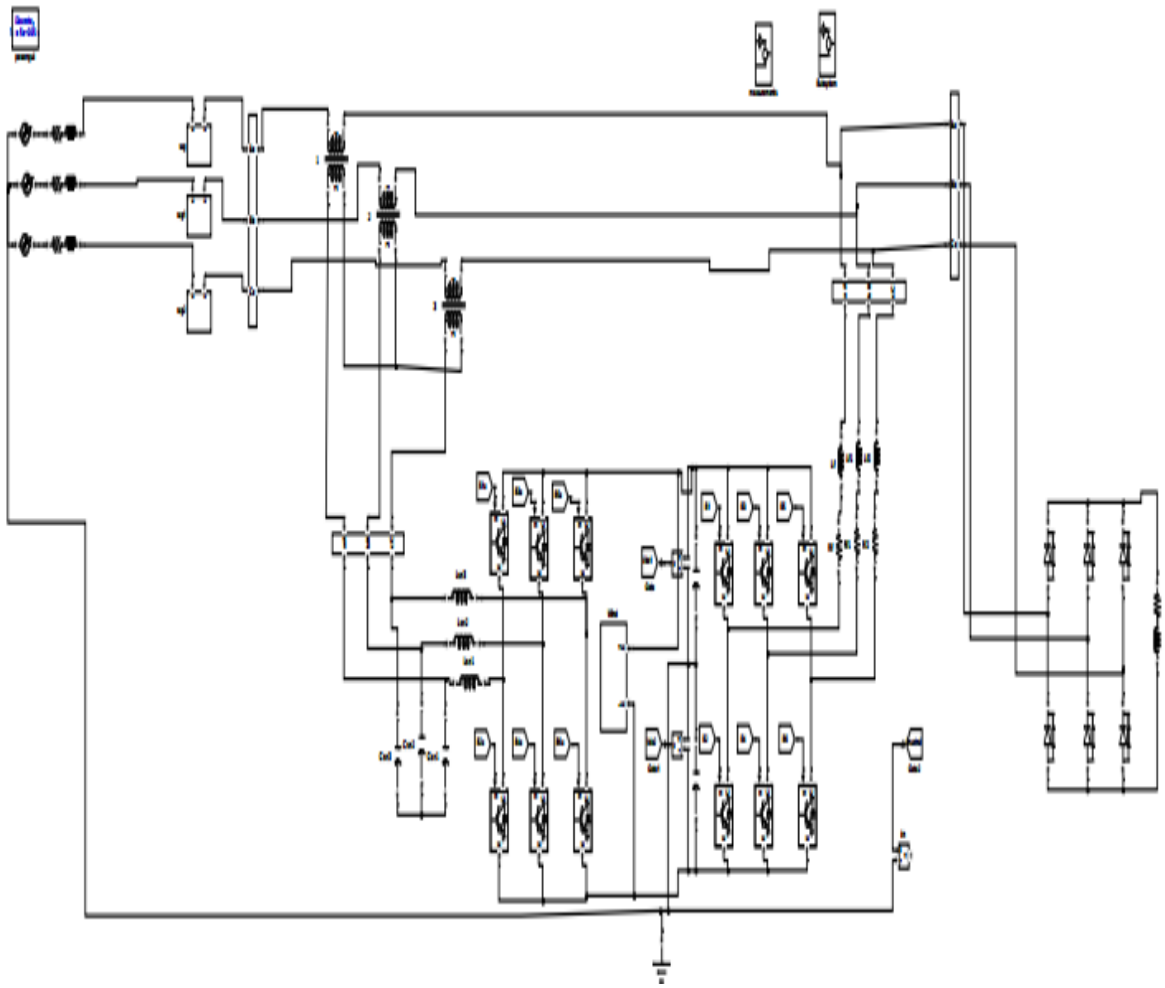

Fig.2. Simulink of UPQC

operation, source and shunt inverter provides 10kW power to load respectively. But when voltage interruption occurs (from 0.2s to 0.6s) active power of source becomes ze- ro and during this interval only shunt inverter provides 20kW active power to load. active power variation of shunt inverter, load, series inverter and source, respectively. In reverse-flow mode, the shunt inverter with DG supplies power to the load and the main source. In normal operation, the shunt inverter provides 10-kW power to the load and the source, respectively. But during the voltage interruption, only the shunt inverter provides 10-kW power to the load.

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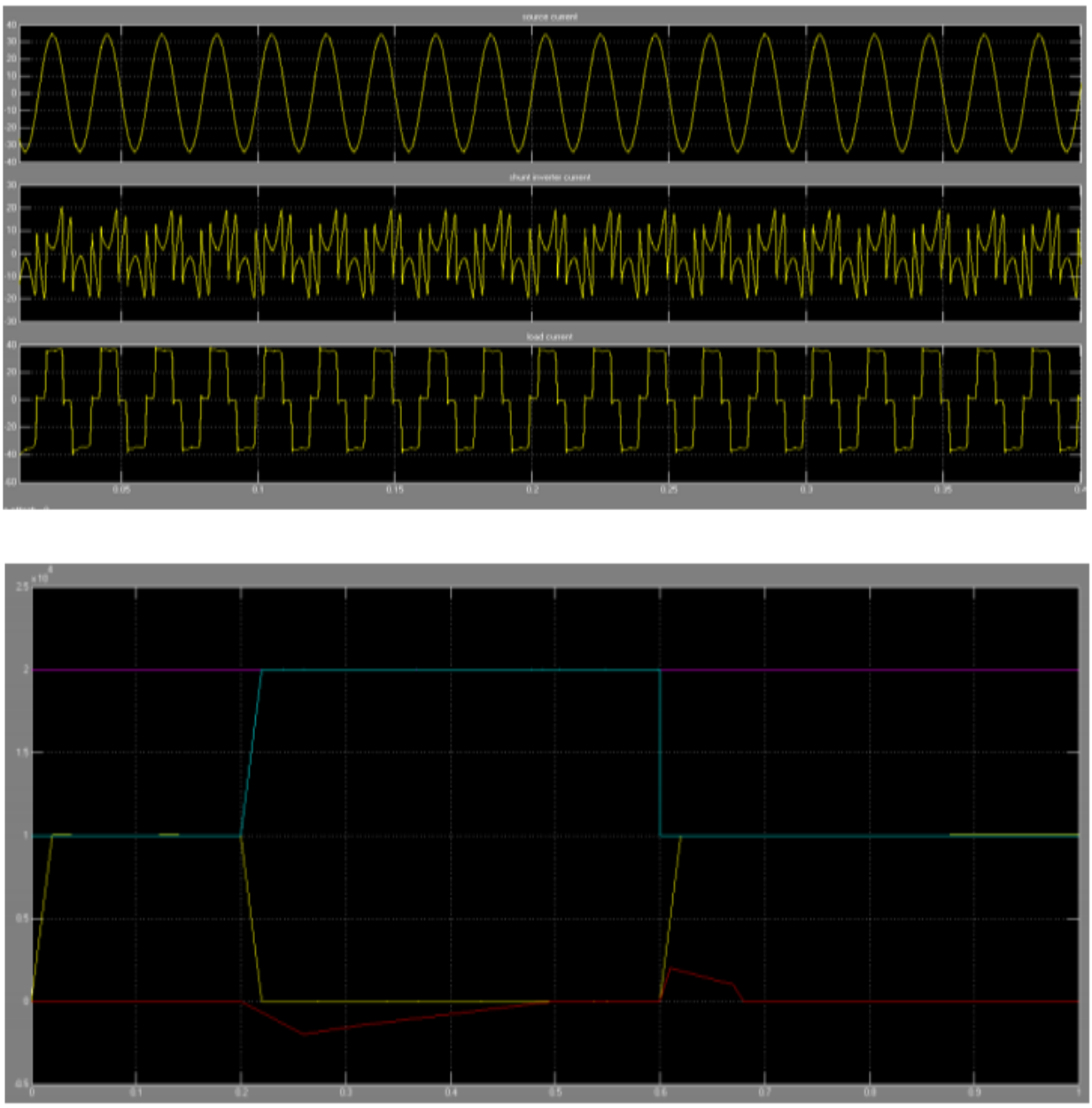

Fig.4. Voltage and active power

CONCLUSION

In this paper, the combined operation of UPQC with DG is explained. The proposed system is composed of series and shunt inverter, wind energy system connected to the DC link through rectifier. The proposed system is able to compensate voltage sag, voltage swell, voltage interruption and current harmonics in interconnected and islanding mode. Hence, the proposed system improves power quality at the point of installation on power distribution system or industrial power systems. The operation of UPQC with DG has been evaluated through simulation studies using MATLAB/SIMULINK software.

REFERENCES

[1] VinodKhadkikar, Member, IEEE," Enhancing Electric Power Quality Using UPQC:A Comprehensive Overview", IEEE Transactions On Power Electronics, Vol. 27, No. 5, May 2012.

[2] B. Han, Senior Member, Ieee, B. Bae, H. Kim, And S. Baek," Combined Operation Of Unified Power-Quality Conditioner With Distributed Gen- eration", IEEE Transactions On Power Delivery, Vol. 21, No. 1, January 2006.

[3] SrinivasBhaskarKaranki, NageshGeddada, Student Member, IEEE, Mahesh K. Mishra, Senior Member, IEEE,B. Kalyan Kumar, Member, IEEE,'' A Modified Three-Phase Four Wire UPQC Topology with Reduced DC-Link Voltage Rating'' 2011 IEEE.

[4] P. DivyaSwathi,K. Vijay Kumar," A New Reduced Type Three Phase Four Wire UPQC Topology for PQ features using VPI" IJIFR volume 2 issue 5 January 2015.

[5] Kuldeep Kumar Singh, J. K Dwivedi," Performance Study of Unified Power Quality Conditioner Using Matlab Simulink", International Journal Of Scientific & Technology Research Volume 1, Issue 11, December 2012.